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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

NGUYEN, LAM S

ART UNIT	PAPER NUMBER
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2853

DATE MAILED: 04/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/921,683

Applicant(s)

CHANG, JUNHUA

Examiner

LAM S NGUYEN

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 September 2003.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-6,8,9 and 13-26 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 2-6,9 and 13-26 is/are rejected.
7) ☒ Claim(s) 8 is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 10 July 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 16.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

In light of the applicants' argument filed on 09/10/2003, the examiner withdraws the Final Rejection (paper 12). In response to the amendment entered 06/25 2003, the new ground rejection is made as follows:

Claim Objections

Claim 8 is objected to because of the following informalities: Claim 8 cannot depend on claim 1 because claim 1 has been cancelled. In addition, claim 8 contains limitations that are already cited in the independent claims 17 and 22, so claim 8 cannot depend on claim 17 or 22 either. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 2-6, 9, 16-18, 20, 22-23, 25 are rejected under 35 U.S.C. 102(e) as being anticipated by Okuda et al. (US 6629741).

Okuda et al. disclose a liquid jetting apparatus, comprising:

Referring to claims 17 and 22:

a liquid jetting head, including a nozzle orifice (FIG. 12a, element 334), a

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pressure chamber (FIG. 12a, element 331) communicated with the nozzle orifice, and a pressure generating element (FIG. 12a, element 336) which varies the volume of the pressure chamber; and

a drive signal generator (FIG. 8, element 241A-C), which generates a drive signal (FIG. 4) including a drive pulse supplied to the pressure generating element, the drive pulse including:

a first expanding element, which drives the pressure generating elements so as to expand the pressure chamber, so that a meniscus of liquid in the nozzle orifice is pulled toward the pressure chamber as much as possible (FIG. 4, element 1) ;

a first contracting element, which drives the pressure generating element so as to contract the pressure chamber expanded by the first expanding element, so that a center portion of the meniscus is swelled in an ejecting direction of a liquid drop (FIG. 4, element 2);

a second expanding element (FIG. 4, element 5) which drives the pressure generating element so as to expand the pressure chamber contracted by the first contracting element, so that a marginal portion of the swelled center portion of the meniscus is pulled toward the pressure chamber (FIG. 24a-b); and

a second contracting element, which drives the pressure generating element so as to contract the pressure chamber expanded by the second expanding element, so that the meniscus is again urged in the ejecting direction to increase jetting speed of a satellite liquid drop which follows a main liquid drops (FIG. 4, element 6);

wherein a contracted amount of the pressure chamber established by the second contracting element is larger than at least one of a contracted amount of the pressure chamber

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established by the first contracting element and an expanded amount of the pressure chamber established by the second expanding element (FIG. 4: $V_b > V_3$); and

wherein the contracted amount of the pressure chamber established by the second contracting element is not larger than an expanded amount of the pressure chamber established by the first expanding element (FIG. 4: $V_2 > V_b$).

Referring to claim 2: wherein a potential difference of the first expanding element (FIG. 4, element 1) is equal to the potential difference of the drive signal (FIG. 4: V_2).

Referring to claim 3: wherein the potential difference of the first contracting element (FIG. 3: $V_3 = 10V$) is not greater than 50 % of the potential the drive signal (FIG. 3: $V_1 + V_2 = 20V$) and wherein a potential difference of the second expanding element (FIG. 3: $V_3 = 10V$) is not less than 40% of the potential difference of the drive signal (FIG. 3: $V_1 + V_2 = 20V$).

Referring to claim 4: wherein the potential difference of the second expanding element is not greater than the potential difference of the first contracting element (FIG. 3-4: both equal to V_3).

Referring to claim 5: wherein the second expanding element (FIG. 4, element 5) is supplied for a time period (FIG. 4, period $t_5 = 2 \mu s$) which is not greater than one quarter the natural vibration period of the pressure chamber (column 24, line 47-50: $T = 14 \mu s$).

Referring to claim 6: wherein a gradient of the second expanding element (FIG. 17, element 390) is greater than a gradient of the first contracting element (FIG. 17, element 386).

Referring to claim 9: wherein a potential difference of the second contracting element (FIG. 37: V_2) is not less than 75% of the potential difference of the drive signal (FIG. 37: V_1).

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Referring to claim 16: wherein the drive pulse includes a preliminary contracting element (FIG. 4, element 7a), which drives the pressure generating element so as to contract the pressure chamber from a reference volume thereof, before the first expanding element is supplied.

Referring to claims 18, 23: wherein the first expanding element (FIG. 4, element 1) is supplied for a time period (FIG. 4: $t_1 = 2 \mu s$) which is not greater than one third or half of a natural vibration period of the pressure chamber (column 24, line 47-50: $T = 14 \mu s$).

Referring to claims 20 and 25: wherein a time period from a start end of the first contracting element to a start end of the second contracting element is not greater than the natural vibration period of the pressure chamber (FIG. 4: $t_2 + t_3 + t_4 + t_5 = 12 \mu s < T = 14 \mu s$).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 13-15, 19, 21, 24, 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okuda et al. (US 6629741) in view of Chang et al. (EP 0947325 A1)

Okuda et al. disclose the claimed invention as discussed above except wherein the drive pulse includes a damping hold element, which holds a termination end potential of the second contracting element for a predetermined time period and a damping element, supplied after the damping holding element to drive the pressure generating element so as to expand the pressure chamber to a reference volume thereof, wherein the damping element is supplied for a time

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period which is not greater than a half the natural vibration period of the pressure chamber **(Referring to claim 14)**, wherein a time period from a start end of the first contracting element to a start end of the damping element is not greater than the natural vibration period of the pressure chamber **(Referring to claim 15)**, wherein the second contracting element is supplied for a time period which is not greater than one third of the natural vibration period of the pressure chamber **(Referring to claims 19 and 24)**, and wherein the time period between the start ends of the first contracting element and the second contracting element falls within a range of one quarter to one third of the natural vibration period of the pressure chamber **(Referring to claims 21 and 26)**.

Chang et al. disclose a method for driving an ink jet printhead having piezoelectric vibrators driven by a drive pulse to expand or contract pressure generating chambers to eject ink drops, wherein the drive pulse includes a damping hold element (FIG. 9, element i), which holds a termination end potential of a contracting element for a predetermined time period and a damping element (FIG. 9, element j), supplied after the damping holding element to drive the pressure generating element so as to expand the pressure chamber to a reference volume thereof, wherein the damping element (FIG. 9, element j) is supplied for a time period (FIG. 9, element T4) which is not greater than a half the natural vibration period of the pressure chamber (column 34-36) **(Referring to claim 14)**, wherein a time period from a start end of a first contracting element (FIG. 9, element d1) to a start end of the damping element (FIG. 9, element j) is not greater than the natural vibration period of the pressure chamber (column 16, line 37-40) **(Referring to claim 15)**, wherein a second contracting element (FIG. 9, element t3) is supplied for a time period which is not greater than one third of the natural vibration period of the

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pressure chamber (column 16, line 20-22) (**Referring to claims 19 and 24**), and wherein the time period between the start ends of the first contracting element and the second contracting element falls within a range of one quarter to one third of the natural vibration period of the pressure chamber (column 16, line 24-29))**Referring to claims 21 and 26**).

Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to modify the drive pulse disclosed by Okuda et al. such that including the damping hold element and the damping element to expand the pressure chamber to a reference volume as disclosed by Chang et al. The motivation of doing so is to prevent a great pulling of the meniscus level to the pressure chamber after the ink drop ejection and damp a vibration of the meniscus as taught by Chang et al. (paragraph [0119]).

Response to Arguments

Applicant's arguments with respect to claim 17, 22 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S NGUYEN whose telephone number is (571)272-2151. The examiner can normally be reached on 7:00AM - 3:30PM.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, STEPHEN D MEIER can be reached on (571)272-2149. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

LN

April 2, 2004


HAI PHAM
PRIMARY EXAMINER